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## HISTORY OF A MONSTROSITY

PRESENTING REMARKABLE PECULIARITIES IN THE  
ARRANGEMENT OF THE NERVOUS SYSTEM;

WITH A

BRIEF INQUIRY INTO ITS TERATOLOGICAL AND MEDICO-  
LEGAL RELATIONS.

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THE circumstances connected with the birth, and the peculiar malformations and deficiencies in the nervous centres of the foetus forming the subject of the following remarks, will, I am led to think, be found deserving the attention of the practical physician, equally with him who is more interested in physiological and teratological inquiries.\*

A female belonging to the labouring class residing in the north of England, who, if I remember rightly, had borne several children, and all well-formed and healthy, was delivered, eighteen months ago, of a female child, at the full term of utero-gestation, exhibiting some peculiarities about the head, which immediately attracted the notice of those in attendance. The child was reported by the surgeon-accoucheur to have breathed. This statement, coupled with some remarks which fell from the same gentleman immediately after the delivery, and more especially, perhaps, the natural curiosity excited in the minds of the female attendants

\* The case was introduced to the notice of the Royal College of Physicians at one of their evening meetings in June.

by the unusual appearances which the child presented, led the more gossiping portion of the community to whisper that the surgeon, knowing the child to be a monster, had destroyed it in the birth. These rumours had been afloat for several days, until at length the registrar of the parish conceived it necessary to acquaint the coroner with the circumstance, and on the ninth day after delivery, the body of the infant, by his direction, was disinterred,\* and a jury was summoned to inquire into the cause of its death. The *post mortem* examination was intrusted to my much esteemed friend Dr Oliver of Carlisle, in conjunction with Mr Rome of Longtown.

I shall here allude only to the more important circumstances of the *post mortem* inspection,—those which sufficed the medical witnesses to form their opinion as to the important question of the child's viability; reserving the minuter anatomical details to be discussed under the head “*anatomical characters*.”

The body and limbs of the *fœtus* were well formed. A large tumour was found to occupy the occipital region, and the posterior part of the neck: this tumour was distended with bloody-coloured serum. The anterior and middle lobes of the brain appeared to be properly developed, and occupied their usual positions in the cranial cavity, whilst the posterior lobes were much smaller, and were partially squeezed through a large abnormal opening or deficiency in the occipital bone. The cerebellum and that part of the occipital bone in which it is normally lodged were wanting. There was not the slightest vestige of *medulla oblongata* or spinal chord, and the posterior arches of the vertebræ did not exist. The lungs sank in water, as well separately and in cut portions, as with the heart attached to them. The medical gentlemen reported as the result of their examination of the body, that as certain portions of the nervous system, which in their belief were essentially requisite for the performance of the respiratory functions, were totally wanting, they had no hesitation in concluding, that the child could not have breathed; and that they were confirmed in this conclusion, by finding no evidence whatever of the lungs having been inflated. The medico-legal investigation ended here; the jury returning a verdict of “Natural Death.”

The facts of the foregoing narrative were mentioned to me personally by Dr Oliver two days after their occurrence. I cannot here overlook the kindness which prompted him to place the *fœtus* in my hands for a more minute dissection† than was possibly consistent with the time and opportunities afforded those who are called upon to conduct a *post mortem* examination, whilst

\* These circumstances occurred during the severest cold of winter, (January 1842), and when the snow covering the public roads was several feet in depth. The tissues of the body had, therefore, not suffered from decomposition.

† In speaking of more minute dissection, I refer especially to the anatomy of the nerves.

a coroner and jury are waiting the results of the investigation in an adjoining room. The reader must not suppose from the above remarks, that the examination was hurried in the slightest degree. The thoracic and abdominal viscera had been carefully examined by my friend and his coadjutor, after they had notified the malformations in the nervous centres, and the inadequacy of these to maintain the springs of life in action, in a being no longer dependent on its maternal sources for nourishment.

To adopt a methodical arrangement of the historical details of the present case, and to render the remarks which naturally suggest themselves in connection with it, as practically useful as their character will admit of, I shall describe, *first*, the configuration and minute anatomy of the foetus ; and *secondly*, endeavour to point out the position which it ought to occupy in the classification of monstrosities adopted by modern authors ; and *finally*, allude to its medico-legal relations.

*Anatomical Characters.—Externally.*—The foetus, as already stated, was of the female sex,\* fat and plump. Its limbs were well-developed, and when placed on its back, nothing irregular could be perceived about the head, face, or trunk. Whilst the anterior, superior and lateral regions of the cranium presented the normal characters of a child at the full period, the integuments were more or less covered with hair ; the occipital region, considerably elevated, was occupied by a soft and elastic tumour, whose size was little short of the foetal head, and which extended laterally and posteriorly so as to conceal part of the neck and likewise a small portion of the back. The common integument formed the external wall of the tumour,—that part which looked towards the vertex being covered with hair. Below the tumour, the dorsal region appeared at first sight normal ; a closer examination, however, detected the absence of the spinous processes, and an unusually flattened appearance at the lowest part of the vertebral column.

*Internal Appearances.—Encephalon.*—An incision was made through the frontal bone at a point immediately above the nose, and continued directly backwards along the sagittal suture to the occipital bone ; the flaps were thrown outwards, and in this way the anterior and upper surfaces of the brain were exposed. At this stage of the dissection, it was noted that the vessels of the *pia mater* were much distended, and that the cerebral structure

\* It would appear that the majority of human monsters, at least, where the nervous system is at fault, belong to the female sex. Morgagni advocates this opinion, which has since received the sanction of Sandifort, Sœmerring, Meekel, Tiedemann, and others. The reports of cases being found in isolated journals, it is difficult to ascertain the exact proportion, but Meekel (*Descriptio Monst. Nonnullor.*, p. 51,) who collected ninety-one cases, found that fifty-three were of the female and thirty-eight of the male sex.

presented the usual healthy characters. The division (along the centre) of the small part of the occipital bone that had been developed, and the integuments forming the wall of the large sac, as also the integument along the mesial line of the dorsal aspect of the body, were next accomplished. This dissection exposed the contents of the tumour, which consisted of bloody-coloured serum. The same kind of fluid occupied the ventricles of the brain and the sub-arachnoid cellular tissue of the base. On the escape of the fluid from the tumour a marked deficiency in the occipital bone (afterwards discovered to be that part which extends from the *foramen magnum* to the occipital protuberance) was detected, and a portion of the cerebral substance about the size of a large walnut protruded through it into the tumour or sac. This portion of nervous substance evidently belonged to the posterior lobes, and was connected at the base of the brain with the *Pons Varolii*, or rather an irregular nodulated looking mass found in the position of the *Pons*. On lifting up the anterior lobes for the purpose of examining, in the usual way, the base of the brain, the presence of a quantity of dirty-coloured serum, similar to that met with in the occipital tumour, rendered the dissection less clear than in other parts. There seemed little doubt, however, of the normal characters of the structures until approaching the position of the *Pons Varolii*, where the nervous substance terminated abruptly. It was found difficult to specify the exact characters beyond what have just been stated of the posterior terminating portion of the base of the brain. The absence of the *cerebellum*, and of that portion of the wall of the cranium which encloses this part of the *encephalon*, renders it extremely probable that this abrupt termination or nodulated portion of cerebral substance did not constitute a true *Pons Varolii*. There was not, as has before been stated, the slightest vestige of *medulla oblongata* or *medulla spinalis*.

*Dura Mater and Spinal Column.*—The *dura mater* was observed to line the walls of the cranium, and to be continued to the inner surface of the tumour, where it became closely connected with the integument. Tracing it from the tumour towards the neck, some shreds\* only could be met with in the spinal canal, and these in pretty close contact with the posterior part of the bodies of the vertebræ. The extreme tenuity of the integuments covering the spinal canal prohibited the supposition of the *dura mater* lining their inner surface in the manner observed to exist in the interior of the sac. The circumstances above narrated evi-

\* This appearance in a case that presented some characters analogous to the *fœtus* whose history I am recording, may have led Professor Duges to say that the spinal canal was filled by a filamentous stratum, ("une couche filamenteuse"), apparently the remains of the spinal cord. The microscopical examination inclines me to believe that the shreds noted above were fibrous, and belonged to the *dura mater*.

ently point out that such a membrane was unealled for in the absenec of that important division of the nervous system which it naturally encloses.

The deficiency in the spinous proecses and laminæ,—in short, of the posterior arches of the vertebral column, might have been antieipated along with the total absenee of the *medulla spinalis*.\* In reference to this deficieney it ought to be remarked that the development of the laminæ had proeceeded pretty nearly to a eompletion in some of the eervical vertebræ; this development was gradually less marked towards the lower part of the column where the bodies alone existed.

*Vascular System.*—The heart was normal, as were all the vis-  
eera of the trunk. I need only allude to the vessels distributed  
upon the nervous centres, and their surrounding walls. The  
carotid arteries of each side, and their divisions into external  
and internal, were in just proportion. The complete develop-  
ment of the anterior and middle lobes of the brain led me to  
anticipate the regular size of the internal carotids, whilst the  
absence of cerebellum and *medulla oblongata* did not prepare  
me for the size of the vertebrals, which deviated very slightly  
from the natural standard. The occipitals were extremely large,  
and evidently related to the growth of the tumour; perhaps the  
vertebrals had been mainly distributed to the same morbid  
growth, which will aceount for their larger size.

With the exeeption of a partially cleft palate, the remaining parts  
of the faee and organs of sense were perfectly developed. The  
thoracic, abdominal, and pelvie viseera were normal.

*Nerves.*—The *Sympathetic* or *ganglionic* system of nerves pre-  
sented their normal characters. I earefully examined the *Cerebral*  
and *Spinal* nerves at their exit from the different foramina in the  
base of the cranium and intervertebral foramina, and on tracing  
them to the periphery of the body, eould detect nothing irregular,  
either in the formation of the different plexuses, or in the anasto-  
moses and ultimate distribution of the nerves to the museular and  
other organs of the body. My attention was now direeted to the  
central extremities of the nerves, or the positions of the nerves  
seen within the cranium and spinal eanal. This part of the in-  
quiry has afforded interesting results.

The *Olfactory* nerves could not be satisfactorily examined. The  
*Optic* nerves were flattened in form, and imperfectly developed.  
The central extremity of the nerve, or that which had been con-  
nected to the eerebral substanee, had been removed along with the  
brain, but the mieroseopieal examination of the nerve, two or three  
lines from the point where it penetrates the sclerotie, displayed

\* This opinion is sanctioned by the labours of Geoffroy Saint Hilaire, Philosophie Anatomique, Paris, 1822; and Serres, Recherches d'Anatomie Transcen-  
dante et Pathologique. Paris, 1832.

only isolated portions of the tubulous structure of the nerve, imbedded in a quantity of fibrous tissue, the appearance of an extremely atrophied condition of the nerve. On dissecting the parts within the orbit, each of the nerves was found distributed in the usual manner upon the muscles, &c. contained in this cavity. The third, (*motor. ocul.*) ; fourth, (*trochleator*) ; and sixth, (*abducens*) pairs of nerves could be traced backwards from the orbit through the *foramen lacerum orbitale*, along the cavernous sinus to its posterior part, where they became so extremely delicate, as to render it difficult to say that they had ever shown themselves beyond the sinus. The three divisions, and Casserian ganglion of the fifth pair were normal ; the portion of the nerve on the cerebral side of the ganglion presented a short truncated appearance. The seventh, (*portio dura* and *portio mollis*) ; the eighth, (*glossopharyngeal, pneumo-gastric, and spinal accessory*) ; and the ninth pairs of Willis, and also the first, second, and third cervical nerves were hanging as loose threads in the cranial cavity, or at the junction of this cavity with that of the most superior portion of the spinal canal. \* The length of these nerves, measured from their free extremities to their entrance of the foramina, through which they make their exit from the cranium and spinal canal, varied slightly from one and three-fourth inches to two and one-fourth inches ; the first cervical nerve being the longest. The remainder of the spinal nerves, though visible without dissection, (the cervical being most distinct) did not hang loose in the cavity in which they were lodged. This anomalous, if not unprecedented condition† of the nerves, made me anxious to ascertain in what way the

\* The free extremities looked upwards and towards the basilar process of the occipital bone. The uniformity of this direction makes it probable that this was their arrangement in the foetus in utero.

† In conversing with my friend, Professor J. Y. Simpson, whose intimate acquaintance with the history of monstrosities is well known, regarding the unusual appearance of the nerves in this case, he kindly informed me that a somewhat similar arrangement of the nerves had been described by Lallemand some years ago. In the course of my reading, I have more than once met with references to Lallemand's case, but have not been able to lay my hands upon the original work, entitled " *Observ. Pathol. propres à éclairer quelques points de Physiologie*, Paris, 1825 ; or his Thesis, published in 1818." M. Ollivier's reference (*Traité de Maladies de la Moelle Epinière*, Paris, 1837, p. 166,) to the case observed by M. Lallemand, distinctly indicates that it was not an anencephalous simply, but along with this malformation the spinal cord was absent. The following quotation from M. Ollivier's analysis of Lallemand's case is justifiable, since a different interpretation has been offered on the mode in which the nerves terminated by those who have had access to Lallemand's work. " *A la surface de cette membrane*" (M. Ollivier is speaking of the *dura mater*) " *on voyait deux rangées de tubercules blanchâtres, de la grossur d'un tête d'épingle, répondant à chaque espace intervertébral. A ces tubercules aboutissaient les nerfs du cou, du des et des lombes. Les racines d'origine de ces nerfs avaient été détruites avec la moelle. En soulevant de chaque côté la dure-mère après l'avoir fendue, on voyait ces nerfs partir de cette membrane pour devenir aux différents trous de conjugaison. Ceux du cou, excessivement grèles, montaient presque perpendiculairement pour passer entre les vertèbres cervicales ; ils ne contenaient pas de substance nerveuse, et cependant, après avoir traversé les trous*

delicate bundles, of which each nerve is composed, terminated; whether the free extremities simply marked out the separation, or breaking across of the nerves from the parts to which they had been attached, (that attachment being nervous or otherwise,) or if they were the true central terminations in the brain or spinal cord of the nerves themselves. Viewing this question as one of considerable interest, every endeavour was made to secure accurate observations. In these inquiries I had the valuable aid of my talented friend Mr GoodSir, whose microscopical investigations are too well known to require any comment here.

The whole of the nerves (hanging loose) of one side were cut across pretty close to their exit from the cranium and spinal canal, so as to obtain at least an inch of their unattached extremities. These were floated in water, and after a little adjustment, the naked eye could detect the existence of a delicate membrane or filamentous-looking tissue, which enveloped the extreme points of the nerves, and appeared to form a kind of connecting medium to these. Small portions of the nerves at the point where these entered the membrane, were placed between two pieces of glass, and on being subjected to a magnifying power of more than 300 diameters, the following facts were observed. In a highly granular-looking membrane, containing nucleated corpuscles of varied size and shape, and here and there presenting a few fibres of filamentous tissue, the bundles of nervous tubes, or the minutest fibrillæ of the nerves, were distinctly seen ramifying. In a few cases, the nervous tubes were in so aggregated a form, or so imbedded in this membrane, that distinct observations could not be made on their ultimate arrangement; at other times in fasciculi so small as to consist only of two,

de conjugaison, ils avaient le volume ordinaire; ceux du dos étaient plus gros, surtout les inférieurs; ils renfermaient de la substance blanche."

Geoffroy St Hilaire (*Philosophie Anatomique*, Paris, 1822,) evidently alludes to the same case, which he calls "L'Anencephale de l'Hotel-Dieu," from its being born in that hospital, (Hotel-Dieu); and in reference to the nerves, he quotes (p. 130,) Lallemand's own words, "tous les nerfs qui naissent du cerveau sont libres et flottans à la base du crâne." This quotation from Lallemand's Thesis expresses the same condition as that described in the text.

Geoffroy St Hilaire describes a nearly similar case to that above, under the term "Anencephale de la Seine." The circumstances which led to this nomenclature are best known to himself and Madame Riguet, who had acted in the capacity of *sage femme* on the occasion. However, the case was not simply an anencephalous, but like that of Lallemand's, was deprived either in part or wholly of spinal cord. In describing the dissection and display of each of the cerebral and spinal nerves, he concludes the sentence thus: "Mais, ce qui forme le haut intérêt de l'observation, nous aperçûmes ces nerfs écartés, isolés, entièrement libres, les uns à l'égard des autres." The reader cannot fail to observe a great resemblance between the *anencephales de l'Hotel Dieu* and *de la Seine*. And whilst G. St Hilaire describes the nerves of the latter (*de la Seine*) as having "ni franges, ni extrémités flottantes," but as being lost in the tegumentary membrane, he at the same time admits the analogy of the two cases, only, however, on the supposition that Lallemand's description of the floating nerves resulted either from preconceived notions, or an imperfect state of the preparation upon which the observations were made.

three, or four tubes; and lastly, and this in the only way in which satisfactory observations could be made, the nervous tubes displayed themselves in an isolated condition or singly. Tracing any one of these tubes from the larger fasciculus of which it formed a component part, onwards to its termination,\* it was observed to diverge slightly, this divergence being continued so as to form a greater or less curve, and then to turn back upon itself, gradually approaching the point from whence we traced it, and forming in this manner a distinct loop, the convexity of which looked towards the free extremities of the nerve, the concavity towards the fasciculus or stem of the nerve. These loops presented a great variety in shape. At one time the nervous tube took nearly a straight course from the fasciculus, and suddenly becoming inflected, formed a loop which enclosed but a small or narrow elliptical space. At another time the space between the component parts of a loop was of considerable size, either of a horse-shoe shape, or almost circular, and not unfrequently resembling the numeral 8, from the twisting of the nervous tube upon itself.† The difficulty of distinguishing more than a few loops at a time may be easily conceived, when it is borne in mind, that, in addition to the high magnifying power, the varied curves and figures of the loops sometimes formed a kind of net-work,‡ and very frequently one part of a loop passed beneath several others; in other words, occupied a lower plane, and so became lost to view. Moreover, the existence of the granular mass, &c. (the remains probably of imperfectly developed cerebral substance,) surrounding the extremities of the nerves, mingled up with a tissue that may be considered to resemble the *pia mater*, into which the loops seemed to be dipping, rendered the demonstration at times unsatisfactory. In specimens, however, where, by repeated washing in alcohol and water, the granular matter had been in a great measure removed from the sides of the nervous tubes, the loops became very distinct, so that the doubts that had been previously entertained respecting the mode in which the nervous tubes arranged themselves in such specimens, were now dispelled. So clear was the demonstration after the granules had disappeared, that those who were altogether unaccustomed to microscopical inquiries could readily detect the existence and true character of the loops. (See Plate IV. Figures 6, 7, 8.)

Having described thus briefly the anatomical characters, it may be well to inquire how far the peculiar arrangement of the primi-

\* The following pages will show that the terms "termination" and "free extremities," which I have made use of to express the extreme points of the nerves hanging loose in the cranial cavity, are not to be taken in an absolute sense.

† These facts will be better understood by referring to the figures which accompany this paper.

‡ This net-work, as we term the arrangement of the loops, must not be confounded with the terminating plexus of Valentin, or such as Burdach has figured in the skin, to which the reader's attention will presently be directed.

tive fibres of the nerves in the monstrosity will apply to the elucidation of a question, at the present day more or less canvassed by the investigators of physiologeal anatomy, viz. the mode in which the nerves terminate. Looking to Germany we observe that nearly the whole of her physiologeal talent, and this is immense, has been for several years, and still is, devoted to the investigation of the minute organization of the brain and nerves. And whilst we admire the wonderful labours of Malpighi, Leeuwenhoek, Fontana, (whose works have never been sufficiently studied,) and others of past ages, in the field of minute anatomy, it is evident that the German school of the present day is justly entitled to the palm of having discovered all the leading faets in the mieroseopical anatomy of the nervous system.\*

The fact of the nerves consisting of cylindrical tubes, and their running parallel to each other, was pretty well known to Fontana, but not received as orthodox until the extended observations of Professor Müller, corroborated by Kroonenberg in 1836, had been published. Müller announced, at the same period, the continuity of the primitive fibres from the centre to the periphery of the body without dividing or inoseulating. It then became a question how the nerves terminated. The greater number of observers directed their attention to the periphery of the body, in the hope of elucidating this question more easily than could be done in the nervous centres, and as their investigations are illustrative of some views which my own observations have inclined me to adopt, I may be permitted to glane at the results of their inquiries.

The peripheral expansion or termination of the nerves in the muscles, skin, &c., has been investigated by Rudolphi, (whose observations cannot be safely trusted,) by Prevost and Dumas,† Wagner,‡ Treviranus, Valentin, Emmert, Schwann,§ Burdach,|| and, more lately, Gerber.¶

Emmert's observations on the museles of the frog led him to state that the primitive fibres of the nerves "run in a serpentine manner over the museular fibres, and having described on them a larger, or smaller arch, they return to another nervous eord, or another nervous bundle, or unite with some other single primitive fibre which has just run a similar course, and accompany it to a

\* The reader is referred to a very able article in the British and Foreign Medical Review, October 1838, on the Structure of the Brain and Nerves. This review, and the Encyclopédie Anatomique, at present in the course of publication, contain almost all the facts relative to this interesting subject.

† Magendie's *Journal de Physiologie*, Tome v. p. 144.

‡ Burdach's *Physiology*, translated into French by Jourdan. Paris, Tome vii. p. 200.

§ See Encyclopédie Anatomique, Tome vii.; Müller's *Physiology*, &c., for the views of Valentin, Emmert, Schwann, and Treviranus.

|| Burdach's Contributions to the Mieroseopical Anatomy of the Nerves. Quoted by Henle, *Traité d'Anatomie Generale*. French translation by Jourdan, p. 193.

¶ Gerber's *General Anatomy*. By George Gulliver, F.R.S.

nervous cord, to which they apply themselves, and in which they then go backwards to the larger nervous stems.\* Treviranus and Schwann supposed that the primitive fibres terminated abruptly. It is more than probable, as Müller and Henle have suggested, that the dipping down as it were of the fibrillæ of the nerves between the muscular bundles, led these distinguished observers into error.

The description given by Burdach,† who made use of the *compressorium* in his investigations, differs not from Emmert in regard to the intricate plexus, (terminating plexus of Valentin,) by means of which is produced "a frequent interchange of primitive fibres among the twigs of the same branch or of different branches;" but, he adds, "from this plexus there come forth, lastly, at a point still nearer the end of the muscle, ramuscules, which, being resolved into single primitive fibres or bundles, of very few fibres, form arches or loops, the convexity of which look towards the end of the muscles, the concavity towards the stem of the nerve." These are the "terminating loops" of Valentin.

The terminations of the nerves in the skin have been variously described. Ehrenberg thinks the nerves lose themselves among blood-vessels, whilst Treviranus describes them as terminating in the cutaneous papillæ. The views of Treviranus are opposed by Burdach and Gluge.‡ Valentin describes the terminating loops in the skin similar to those met with in the muscular tissue. Gerber believes each papilla to contain a vascular and nervous loop. Burdach, whose observations seem to have been made with great care, is opposed to the existence of terminating loops, and believes that the primitive fibres of the cutaneous nerves can be traced from their parent stem through the cutaneous net-work,—sooner or later to join themselves to another cutaneous nerve, and, in this way, to return to the central organ.§ Breschet and Roussel de Vauzème|| at one time admit, at another time deny, the existence of nerves in the papillæ of the skin, and finally conclude that the arrangement of the nerves in the dermoid tissue is unknown.

With respect to the nerves in the other tissues of the body, it would appear from Valentin's researches, "that the nerves have, properly speaking, no peripheral termination, but that in their peripheral organs, the centrifugal part passes without any definite change into the centripetal."

In reference to the central terminations of the nerves in the brain, or rather the mode in which the "varieose fibres," (Valentin,) or "primitive cylinders," (Treviranus,) viewed as the continuation of the nervous tubes, terminate, there has been much discussion.

\* British and Foreign Medical Review, October 1838.

† Loc. cit. and British and Foreign Medical Review.

‡ L'Institut, 1838, No. 232.

§ Burdach's drawing of the net-work accompanies the review in the British and Foreign Medical Review.

|| Nouvelles Recherches sur la Structure de la Peau, p. 17, 20, and 21.

Valentin states that the bundles of fibres of the brain form most beautiful and intricate plexuses, and that on the surface of the cerebrum and cerebellum, in the yellow substance, or the transition substance from the gray to the white, he saw numerous isolated loop-like terminations of the cylinders of the white mass. These "terminating loops" have been seen by Valentin in the horse and pigeon.\* No one, as far as I am aware, has verified these important observations of Valentin. Professor Carus† infers the existence of the cerebral loops on physiological grounds, and hesitates not to attribute different functions to the component parts of a loop. Burdach objects to the mode in which Valentin conducted his investigations, and states that he (Burdach) never could see any such loops; at the same time, knowing the difficulty of this inquiry, he would rather not oppose his limited observations to those of Valentin. Henle‡ utters the same sentiments as Burdach, whilst Remak§ believes that Valentin has mistaken the large arches formed by the primitive fibres for terminating loops. With these statements before us, it is impossible to arrive at any opinion regarding the termination of the primitive cylinders of the brain, now acknowledged as the continuation of the nervous tubes. Those who infer from analogy the existence of cerebral loops, instance the great talents of Valentin; those who are opposed to such an arrangement cite the weighty authority of Burdach, Henle, and Remak, and so the matter has been *sub judice*.

The rare opportunity afforded by the present case offers considerable advantages over the dissections that have been made on the brain of different animals, in deciding the points of disputation in the above paragraph. The comparatively soft character of the brain, even in its freshest state, the existence of globules, &c. around the primitive cylinders, the necessity of obtaining the very thinnest section, and the use of instruments which may impair the exact character of the structures under examination, are circumstances which render the inquiry extremely difficult in the hands of the best micrographers. In the monstrosity, on the other hand, the length of the nerves, which were loose or easily isolated, and the readiness with which they hardened in spirits, were favourable circumstances,—in short, there was no difficulty presented excepting the presence of the delicate membrane, and this could generally be

\* *Über den Verlauf und die Letzten Enden der Nerven von Dr G. Valentin.* (*Nova Acta Physico Medica, &c.*, 1836, Tomus xviii. p. 92, &c.) If the reader refers to the drawings given by Valentin, (Tab. vii. Fig. 59,) he will observe that the terminating loops of the nerves, as seen in the brain of the pigeon, bear considerable analogy to the arrangement I have described and figured as occurring in the human; allowance being made for the peculiarities which different species of animals are likely to present.

† Müller's *Archives*, 1839, p. 368.

‡ *Encylop. Anatom.* Tom. vii. p. 227.

§ *Ibid.* p. 228.

overcome by well arranged compression. It is a little surprising that no one had conceived the idea of investigating microscopically the nerves of monstrosities in whom the central masses were more or less deficient, for the purpose of ascertaining the termination of the nerves: the anencephalous monsters, for instance, would appear to offer favourable conditions for the inquiry, as the encephalic nerves can generally be seen running into a fungous-looking mass, or, as in others, a membrane covering the irregular and imperfectly developed base of the cranium. Impressed with these views, and desirous of testing their accuracy, I gladly availed myself, during the present summer, of the opportunity which Professor Simpson, with his characteristic kindness, had afforded me of dissecting an anencephalous foetus. In this foetus several of the nerves\* were traced to the membrane, found in pretty close contact with the base of the cranium, whilst a few were free or attached in such a way that the slightest handling sufficed to make them appear as isolated threads. The microscopic examination of these nerves displayed the terminating loops, as in the previous case.

Conceiving it of greater import to be able to announce the mode in which the nerves terminate in the cerebro-spinal axis of man, I have not deemed it necessary to repeat the observations made by Valentin on the brain of the lower animals; knowing well that the object sought by Valentin in his researches on the pigeon, &c. was to promote our investigations into the human structures, where, owing to circumstances already alluded to, microscopic inquiries are beset with great difficulties. The interesting facts culled from these malformations led me to remember, and at the same time to appreciate, the remark made by Mr Lawrence,† "that we cannot fail to learn something as to the mode in which nature proceeds by attending to the imperfect sketches which she seems to have abandoned as incapable or unworthy of being completed."

My observations have not been sufficiently numerous to allow of any decided opinion being offered as to the primitive fibres of the nerves continuing distinct from the centre to the periphery of the body, at the same time, I may state that these observations made on different nerves of the orbit to the extent of nearly three-fourths of an inch, inclined me to suppose that the component parts of each nervous loop are continued from the central organs, alongside of each other, to the tissue in which they are distributed, here, again, forming a loop, which may be called the peripheral loop. Such a view would be confirmative of the opinion propounded by Valentin, that there is no termination, properly speaking, of the nerves.

It would be injudicious at the present time to hazard any phy-

\* The nerves became delicate as they approached the membrane.

† Medico-Chir. Trans. Vol. v. p. 170.

siological doctrines, based on the anatomical details (however curious and interesting they may appear) which I have recorded in the preceding pages. When it becomes more generally known that the nerves are tubular and contain a fluid; and when, as will shortly be the case, it is received as an established fact in anatomy, that the nerves terminate in the form of loops in the cerebro-spinal axis, and likewise at the periphery of the body, highly speculative doctrines may be expected to flow from the electro-chemical school,—a class of physiologists formerly numerous, and even now at times attractive, but who, happily for science, are gradually retreating from their position, and joining that standard which the philosophic mind of Alison, and the persevering zeal of his disciples have so firmly implanted in the field of physiology.

*Teratological Remarks.*—It is unnecessary to enter into any lengthened remarks on the tumour occupying the occipital region. The reddish-coloured serum was not contained in a number of cysts, as has sometimes been observed,\* but in a single bag or sac.† There were no portions of nervous substances floating in the fluid, as observed in Marrigne's‡ case. I forbear noticing the development and formation of this tumour, its probable influence on the cerebral functions, together with other circumstances relative to its history, as tumours of a similar kind are frequently observed in connection with various malformations of the nervous masses.

The exact arrangement of the membranes could not be ascertained. It would appear, however, that the lining membrane of the large tumour had formed a kind of partition between the contents of the tumour and the parts below, as the imperfect spinal canal was not distended with fluid.

Cases, where the brain is absent, as in anencephalous monsters, are frequently met with.

The cases of simultaneous absence of brain and spinal cord (aménencéphalic of Beclard) are chiefly recorded by the older authors.§

\* The existence of a number of these small bags or hydatid cysts, comprising the large tumour, has been occasionally noticed. The character of these is well illustrated in a case of *Nosencephale*, dissected by Isodore St Hilaire and Martin St Ange (Histoire des Anomalies, &c. par Isod. St Hilaire, T. ii. p. 338.)

The late Dr Heysham, the highly talented physician who framed the Carlisle Bills of Mortality, relates the case of an anencephalous female child, in whom life was prolonged for six days, and where a large excrescence, occupying the upper part of the deficient cranium, continued to discharge a thin watery fluid, sometimes tinged with blood during the three or four days preceding her death. This discharge proceeded from the rupture of several small cysts scarcely as large as a nutmeg, the walls of which probably ulcerated and reduced the tumour to nearly one-half its original size. For other circumstances relative to this interesting case which occurred in 1788, see Memoirs of the Manchester Lit. and Philos. Soc. Vol. v. part ii. page 496.

† See a case related by Collins, Practical Midwifery, p. 511.

‡ Journal de Med. Chirur. Pharm. Supplém. à l'anné, 1770. T. xxxiv. p. 53.

§ (De Sed. et Caus. Morb. Epist. 12, 8, &c. Morgagni speaks of Fontanus, Hoffmann, Vanhorne, &c. having met with such cases; also Valsalva. In France, Littre, Fauvel, Mery, Burgoine, and more lately Andral, (Arch. Gen. de Med., 1826, p. 636,) say they have dissected such cases.

In none, excepting two related by Faúvel and Mery, was life said to be manifested, and, from circumstances to be noticed under the "medico-legal remarks," they cannot be received as authenticated proofs of living amyelencephalous monsters.

The absence of spinal cord (amyelie of Beclard) has been observed by Rusch, Anselin, Malacarne, &c., but as M. Ollivier,\* who quotes these cases, will not admit of the existence of an encephalon where the spinal cord is wanting, it may be supposed that in each of these cases there was no portion of the cerebro-spinal axis. That, along with the absence of spinal cord, we may expect a deficient encephalon, if not other considerable deviations in the economy, is fully illustrated in the history of monstrosities, at the same time, I humbly conceive that it would be hasty to infer, as M. Ollivier has done, the absence of encephalon in all cases where the *medulla spinalis* is wanting. The great frequency of the anencephalous monsters has appeared sufficient proof to many of the development of the encephalon being secondary to that of the spinal cord, and doubtless this is the general opinion on the subject. It may, however, be observed that the knowledge which we at present possess of the development of the nervous centres is not so complete or well determined, as to enable us to lay down positive laws regarding the priority of formation of any division of the cerebro-spinal axis. Two cases of absence of spinal cord are noticed by Morgagni,† and have been copied by him from Rayger.‡ They are thus described: "Mihi enim ex binis Caroli Raygeri, observationibus bene pensitatis videtur in duobis maturis fœtibus cerebrum quidem maxime deformatum, sed non destrunctum fuisse, cum in utroque *spinalis medullæ esset nulla*, aut certe nil nisi sanguis concretus, aut sanguini concreto simile." Whilst we admit the plausibility of the objections urged by M. Ollivier against such observations, where the facts are so briefly stated, there is this much to be said in favour of Rayger, that coagulated blood could hardly be confounded with medullary matter. Whether Rayger has reported the circumstances correctly or not, the monstrosity, whose history I am recording, sufficiently demonstrates the absence of a spinal cord, even where the encephalon was almost wholly developed.

I have in vain searched in the history of monstrosities for an individual case to which the one under consideration might be linked. Multifarious and remarkable as are the malformations of the nervous system, whether these consist in an excess or deficiency, no instance has offered itself where the absence of the spinal cord, medulla oblongata, and cerebellum, was associated with an almost perfect brain. The authorities on this subject, Meckel, Beclard,

\* *Traité des Maladiés de la Moelle Epinière*, p. 165.

† *De Sed. et Caus. Morb. Epist. xii. art. 10*, p. 91.

‡ *Eph. Nat. Cur. Dec. i., A. 3*, and 64 A. 8.

Geoffroy St Hilaire, &c. have not attempted to classify an anomaly of this kind. Such never having occurred in history, there was no necessity for anticipating "freaks of nature;";\* whilst not a few, along with M. Ollivier, deny the possibility of such malformations ever being developed.

The absence of a spinal cord entitles the case I am recording to be placed in the *Amyelie* of Beclard, but as the encephalon was imperfect with slight deficiency of cranium and protrusion of the posterior lobes into an hydrocephalic expansion, an *additional* term is required, and perhaps that of *Hydrencephalocele* is the most applicable, and if necessary to have one term *Hydrencephaloceleamyelie*.

*Medico-Legal Remarks.*—The circumstances involved in the judicial inquiry instituted on this case, may be discussed under two queries; 1. Had the child breathed? 2. Were the abnormal conditions which the foetus manifested compatible with life?

In reference to the first of these questions, it may be stated that the lungs sank in water, no air could be pressed out of cut portions under water, and their specific gravity, either when entire or divided, seemed much the same as that of so much liver. The *foramen ovale* of the heart was quite patulous, as also the *ductus arteriosus*, both of which had evidently undergone no change from the true foetal condition. These circumstances afforded sufficient evidence that the child had not breathed.†

The second question was most judiciously responded to in the negative. Dr Oliver stated without any reserve, that in the absence of the spinal cord, and especially that part to which the nerves of respiration are attached, it was impossible that the child could maintain an independent existence. Our present knowledge of the nervous system fully warranted this opinion, nevertheless it is well to be aware that cases of an opposite tendency are recorded, and that these are sometimes adduced as proofs that the nervous centres are not essential to the maintenance of life

\* In using the term "freaks of nature," I do not for a moment suppose that the God of Nature is pleased to create organized beings irregular and deformed, but heartily concur in what has been elegantly stated by Chaussier and Adelon, who, after recounting numerous facts relating to the causes of monstrosities in the organized world, conclude thus: "Tous ces faits nous semblent établir que les germes des animaux et des végétaux sont émanés purs et réguliers de la main du Créateur; enfin, que toute difformité ou monstruosité sont subséquentes et résultent de divers chocs ou dérangemens, ou de l'inégal nutrition, etc, de ces mêmes germes." *Dictionnaire des Sciences Médicales*, 1819, Tome xxxiv. p. 140.

† The numerous cases lately adduced by Mr Taylor of London and Dr Geoghegan of Dublin, (Guy's Hospital Reports, Vols. v. and vii.) and Dr Joerg, (De Morb. Pulmon. Organico, ex resp. Neonator imperfecto orto: quoted in Dub. Journ. Vol. v. p. 36. ;) and Nicolai, (Brit. and For. Review, July 1843,) &c. ought to be well attended to before the medical man ventures upon a decided opinion in cases of infanticide where the evidence rests in a great measure on the state of the lungs. The medical witnesses in this case had been well aware of the importance of the inquiry as shown in the text.

for a short period. Let us inquire into the validity of these cases. M. Fauvel, in 1701, showed the French Academy of Sciences a foetus without brain, cerebellum, or spinal cord, but in other respects well-formed and at the full time, which lived two hours, and gave signs of feeling when the water of baptism was sprinkled on its head. The following quotation, which in length exceeds the description given of the foetus itself, tends to show that the case was not a solitary instance of absence of the nervous centres, so damning to the hypotheses then taught in the schools of animal spirits regulating the different vital processes. “ Ce n'est par la premiere fois que l'on a vu ce fait, done on tire une terrible objection contre les Esprit-Animaux, qui doivent s'engendrer dans le cerveau, ou tout au moins dans la Moelle de l'épine, et que l'on croit communement si nécessaires à toute l'économie animale.”\* M. Mery† in 1712, reported a more extraordinary case to the same Academy, of a male child born at the fulltime without brain or spinal cord, which lived twenty-one hours and took some nourishment. It is added that several parallel instances have been reported, but the references are not given. No one can peruse the history of MM. Fauvel and Mery's cases, without being struck with the extreme brevity of the description; no mention being made of the condition of the nerves of the cerebro-spinal and sympathetic system, or of the form and characters of the cranial and spinal cavities. Numerous other omissions of an important kind sufficiently indicate the extreme carelessness of the description. We must also bear in mind that the above cases occurred at a time when anatomical observations were less accurate and precise ‡ than at the present day, and when vague and hastily formed hypotheses, rather than a close scrutiny of physiological phenomena, occupied the minds of the profession. Moreover, other circumstances, which it is not easy to conjecture at this distant period, may have misled the authors,—and the probability of any, or perhaps all of these sources of error prevailing, is calculated to render us very sceptical as to the character of the cases being such as Fauvel and Mery have reported them. In 1730, or about that period, M. Belgrand described a foetus of eight months, which lived four hours without encephalon and spinal cord. A tumour with serum occupied the upper part of the neck.

\* Histoire de l'Acad. Roy. des Sciences, 1711, p. 13. † Ibid. 1712, p. 51.

‡ Detharding, his son, along with Alban, describe a case in the Nov. Act. Nat. Cur. x. part ii. p. 703, where the spinal cord was absent. The only proof they give of this was the introduction of a sound into the spinal canal! M. Rouant, by employing the same means of exploration, was led to believe in the absence of the spinal cord;—a more correct investigation of the canal displayed a spinal cord somewhat less than the normal size! (Histoire de l'Acad. des Sciences, pour 1713, p. 20.) Such cases strikingly exhibit the mode in which anatomical inquiries were pursued, and at the same time confirm the accuracy of the opinions expressed in the text.

It is well remarked by M. Ollivier,\* that as the spinal canal does not appear to have been opened below the fourth cervical vertebra, we cannot look upon the case as proving the absence of spinal cord. Another century had elapsed, and though numerous cases of monstrosity, exhibiting marked deficiencies in the central masses of the nervous system were met with at home and abroad, leading to various and highly speculative inquiries as to the purposes fulfilled in the economy by the brain and spinal cord respectively, no single instance occurred where life was sustained for a time without nervous centres, and physiologists had either forgotten the history of, or determinedly set aside as unworthy of trust the cases reported by Fauvel and Mery. In 1833, however, the profession in this country were startled by the announcement that Spessa, an Italian surgeon, had described a child wanting the encephalon and *medulla oblongata*, which had lived eleven hours. A careful perusal of the case† will convince the reader that the greater part, if not the whole, of the *medulla oblongata* was present. Spessa does not mention how the nerves distributed on the organs of circulation and respiration terminated above, or whether or not they were connected with the mammillary portion described at the summit of the spinal cord. Such omissions render the history of Spessa's case very incomplete. The more closely we examine into the details of the cases just alluded to, the more convinced are we that it would be unsafe to infer that any such important phenomenon in the chain of life as that of respiration could be manifested in the absence of a nervous centre, to which the impression *besoin de respirer* could be conveyed.

\* *Traite de la Moelle Epiniere*, p. 164.

† The "Lancet," (January 26, 1833), in quoting the case from the *Gazette Medicale*, Janvier 15, 1833, as "important and extraordinary," &c. has been a little ineptuous, as the following extract from their own translation, shows. "Behind the neck arose a nipple-like protuberance, resembling pretty closely the extremity of the little finger." \* \* \* The touching of this prominence invariably occasioned an acceleration of the respiratory movements, &c. \* \* \* The spinal cord had its origin from this protuberance, and entered the rachidian canal by an opening situated behind, *between the base of the skull and the atlas*." Why should Spessa speak of the "rachidian cord and cord itself" if the spinal cord alone had been present.

The Lancet remarks on the case, "it is sufficient for us to mark the all-important physiological fact of the carrying on of the respiration, and the movements of the larynx without the influence of the brain, cerebellum, or *medulla oblongata*." It is to be hoped the distinguished Editor does not adhere to these doctrines in his present capacity of coroner for Middlesex.

#### Description of the Figures. Plate IV.

Fig. 6. A washed specimen, exhibiting the simple loops divested of granular matter; the interior of nervous tube containing granules.

Fig. 7. Loops of varied figure; the nervous fasciculus or stem to which they belonged is obscured by the granular matter.

Fig. 8. A figure of 8 loop distinct, and a portion of a second loop running in close contact with one side of it and then diverging, is lost in the granular matter; a third passing beneath the two former, and lost to view in the same way. (Magnifying power above 300 diam.)









